AQA GCSE Biology | 8461

SPECIFICATION POINT 4.6.3.4

Evidence for evolution

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**25**
Available paper years	**2007–2025**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.6.3.4 Evidence for evolution

Answer 01 · Mark scheme January 2007 | BLY1F | Original Q1 | Legacy

Question 1

	answers	extra information	mark
(a)	any **two** from: • streamlined / shape reduces friction / long and thin / smooth surface OWTTE • fins / flippers / tail / paddle • structures that push against water	do **not** accept 'arms' or 'legs'	2
(b)(i)	any **two** from: fossil has hind limb / legs / feet fossil has more ribs / bones fossil has teeth fossil has curved spine	it = minke accept any valid comparison	2
(b)(ii)	billion give evidence for		1 1
total			6

4.6.3.4 Evidence for evolution

Answer 02 · Mark scheme June 2007 | BLY1B | Original Q8 | Legacy

Eight	**2**	**2**	**4**	**4**

Answer 03 · Mark scheme November 2007 | BLY1B | Original Q8 | Legacy

Eight	**4**	**2**	**3**	**2**

Answer 04 · Mark scheme March 2008 | BLY1BP | Original Q8 | Legacy

Eight	**3**	**2**	**3**	**2**

Answer 05 · Mark scheme November 2008 | BLY1BP | Original Q5 | Legacy

Five	**A** observed that all species change over time **3** **B** had sufficient evidence to prove evolution **4** **C** thought that evolution was by natural selection **1** **D** changes that happen during an organism's lifetime are inherited by offspring **2**			
	A	**B**	**C**	**D**

Answer 06 · Mark scheme November 2008 | BLY1BP | Original Q8 | Legacy

Eight	**1**	**2**	**1**	**2**

4.6.3.4 Evidence for evolution

Answer 07 · Mark scheme

January 2009 | BLY1F | Original Q4 | Legacy

question	answers	extra information	mark
4(a)	protection / defence from predators / from being attacked / from being eaten	ignore insulation **or** rolls into a ball ignore camouflage	1 1
4(b)	looks like snake / looks scary deters predators **or** has large eyes to spot predator **or** camouflage **or** warning colouration from predator or prey	allow **two** separate adaptations for **2** marks	1 1
4(c)(i)	natural selection		1
4(c)(ii)	Darwin		1
4(c)(iii)	simple life forms		1
4(d)	believe that God created all organisms **or** humans there from the beginning		1
Total			**8**

4.6.3.4 Evidence for evolution

Answer 07 · Mark scheme January 2009 | BLY1F | Original Q4 | Legacy

Biology BLY1F - AQA GCSE Mark Scheme 2009 January Series

COMPONENT NUMBER: BLY1F

COMPONENT NAME: Science B / Biology

STATUS: Final

DATE: January 2009

Answer 08 · Mark scheme March 2009 | BLY1BP | Original Q6 | Legacy

Six	**2**	**1**	**4**	**1**

Answer 09 · Mark scheme November 2009 | BLY1BP | Original Q6 | Legacy

Six	**1**	**2**	**1**	**3**

Answer 10 · Mark scheme November 2009 | BLY1BP | Original Q8 | Legacy

Eight	**4**	**4**	**2**	**3**

Answer 11 · Mark scheme June 2010 | BLY1BP | Original Q6 | Legacy

No matching mark scheme was available in the supplied archive for this question.

Answer 12 · Mark scheme November 2011 | BLY1BP | Original Q8 | Legacy

Eight	**4**	**1**	**2**	**2**

4.6.3.4 Evidence for evolution

Answer 13 · Mark scheme

June 2012 | BL2FP | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)	remains of an organism **or** bone / shell / hard part of an organism / impression further detail – eg in rock / from a long time ago	 if numbers, greater or equal to hundreds of years allow made of minerals ignore over time ignore fossil are rocks	1 1
3(b)(i)	D		1
3(b)(ii)	B		1
3(b)(iii)	predation / disease / lack of food / competition / loss of habitat / climate change / catastrophic event – or volcanic eruption / flood / drought / temperature change / weather change / ice age / change in atmosphere	ignore human effects ignore pollution effects / acid rain ignore human effects allow natural disaster	1
3(c)	C = 'widest' thickest / wider thicker column **or** more fossils (of type C found)	allow biggest / er	1
3(d)	members of the groups have similar physical structures	extra box ticked – cancel	1
Total			**7**

4.6.3.4 Evidence for evolution

Answer 13 · Mark scheme

June 2012 | BL2FP | Original Q3 | Legacy

BL2FP

4.6.3.4 Evidence for evolution

Answer 14 · Mark scheme

January 2013 | BL1FP | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)(i)	natural		1
7(a)(ii)	simple		1
7(a)(iii)	three billion		1
7(b)	any **two** from: • reference to religion • insufficient evidence / couldn't prove it / no proof • mechanism of inheritance / variation not known • reference to other theories • reference to Darwin's status	ignore no evidence allow genes / DNA not known about	2
7(c)(i)	tree		1
7(c)(ii)	hippopotamus **and** pig	both required, either order allow hippo	1
7(c)(iii)	new evidence from fossils		1
Total			**8**

4.6.3.4 Evidence for evolution

Answer 14 · Mark scheme

January 2013 | BL1FP | Original Q7 | Legacy

BL1FP

4.6.3.4 Evidence for evolution

Answer 15 · Mark scheme

January 2013 | BL2FP | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)(i)	animal walking on soft material **or** suitably named material **or** further detail – eg dries out / buried / hardens / turns to rock	 do **not** allow general descriptions of how fossils are formed **or** reference to bones not decaying	1
3(a)(ii)	any **one** from: • (from) bones / shells / hard parts **or** from parts that do not decay / rot or are preserved • animal trapped in resin / amber / ice / peat • infiltration with minerals / named	 ignore imprint / impression allow frozen	1
3(b)	any **two** from: examples of physical factors such as flooding, volcanic activity (allow volcanoes) asteroid collision, drought, ice age / temperature change examples of biological factors such as predators (allow hunters), disease / named pathogen, competition lack of food / mates, cyclical nature of speciation / isolation / lack of habitat or habitat change	 accept 2 physical factors or 2 biological factors or one of each for full marks ignore pollution If no other answers given allow natural disaster / climate change / weather change / catastrophic event / environmental change for **1** mark	2

Question 3 continues on the next page . . .

4.6.3.4 Evidence for evolution

Question 3 continued . . .

question	answers	extra information	mark
3(c)	older fossils simpler **or** change (with time)	to gain the mark there must be implication of change ignore evolve ignore extinction	1
3(d)	insufficient / no evidence / no remains **or** fossils survive	ignore no people were there allow no proof	1
Total			**6**

4.6.3.4 Evidence for evolution

Answer 15 · Mark scheme

January 2013 | BL2FP | Original Q3 | Legacy

BL2FP

4.6.3.4 Evidence for evolution

Answer 16 · Mark scheme

June 2013 | BL2FP | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)(i)	(remains of) an organism / a bone / a shell / hard part of an organism / part of organism that does not decay / impression of an organism / footprint / burrow / rootlet trace further detail – eg in rock / ice/ amber / mineralisation **or** from a long time ago / many years ago	 if number, > 1000 years ignore hundreds	1 1
2(a)(ii)	older fossils are simple(r) **or** fossils show change / adaptation with time	must make ref to change and time allow deeper fossils are simple(r)	1
2(b)(i)	18 to 30	allow 30 to 18 allow 12 ignore units	1
2(b)(ii)	small sample	allow only 49 shells / not representative / not enough evidence allow not all fossils found	1
2(c)	example of a physical factor such as flooding, volcanic activity (allow volcanoes) asteroid collisions, drought, ice age / temperature change **or** example of a biological factor such as predators / disease / competition / lack of food or mates / cyclical nature of speciation / isolation / lack of habitat or habitat change	allow natural disaster / climate change / weather change / catastrophic event / environmental change ignore human factors eg hunting / pollution	1
Total			**6**

4.6.3.4 Evidence for evolution

Answer 17 · Mark scheme June 2014 | BL2FP | Original Q4 | Legacy

4(a)	fossils show change over time.		1	AO1 2.8
4(b)	covered in sediment / mud or sinks into the mud soft parts decay / are eaten **or** bones / hard parts / shell do not decay minerals enter bones / parts are replaced by minerals / mineralisation	 accept turns to rock allow 'is an impression' / 'imprint' / 'cast'	1 1 1	AO1 / AO2 2.8.1a, b
4(c)	skin is soft / skin not preserved / not fossilised / skin decays	accept not enough / no evidence / no-one has seen one allow 'this fossil is only bones'	1	AO3 2.8, 2.8.1c
4(d)	any **two** examples of: physical factors such as volcanic activity (allow volcanoes) / earthquakes / asteroid (collision) / ice age / temperature change **and / or** biological factors such as predators / disease / named pathogen / competition/ lack of food / mates / cyclical nature of speciation / isolation / lack of habitat or habitat change	accept 2 physical factors or 2 biological factors or one of each for full marks ignore pollution if no other answers given allow natural disaster / climate change / weather change / catastrophic event / environmental change for 1 mark	2	AO1 2.8.1e
Total			**7**	

4.6.3.4 Evidence for evolution

Answer 17 · Mark scheme

June 2014 | BL2FP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / spec ref.

4.6.3.4 Evidence for evolution

Answer 18 · Mark scheme June 2015 | BL2FP | Original Q6 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(a)(i)	any **two** from: • trapped / held (since sticky) • engulfed / covered by resin • prevented decay	allow engulfed / covered by amber	2	AO2 / AO3 2.8.1b
6(a)(ii)	any **two** from: • animal / plant (dies and) body covered in sediment / mud • bones / shells / hard parts do not decay • minerals enter bones / parts are replaced by other materials / mineralisation • preserved traces / footprints / burrows / rootlet traces / impressions / casts	ignore ref to rock allow covered in tar / ice	2	AO1 2.8.1b
6(b)(i)	New technology provides more valid evidence.		1	AO3 2.8

4.6.3.4 Evidence for evolution

Answer 18 · Mark scheme

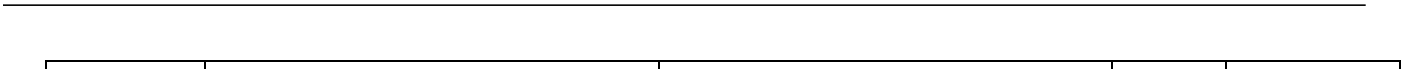
June 2015 | BL2FP | Original Q6 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(b)(ii)	any **three** from: examples of physical factors, eg • flooding • drought • ice age / temperature change examples of biological factors, eg • (new) predators (allow hunters) • (new) disease / named pathogen • competition for food • competition for mates • cyclical nature of speciation • isolation • lack of habitat or habitat change	accept 3 physical factors or 3 biological factors or some of each for full marks ignore pollution competition must be qualified **if no other answers given allow** natural disaster / weather change / catastrophic event / environmental change / climate change for **1** mark	3	AO1 2.8.1e
Total			**8**	

4.6.3.4 Evidence for evolution

Answer 18 · Mark scheme

June 2015 | BL2FP | Original Q6 | Legacy



4.6.3.4 Evidence for evolution

Answer 19 · Mark scheme

June 2017 | BL2FP | Original Q2 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)(i)	remains of an organism (which was alive) a long time ago	allow skeleton / shell / impression if years given, must be >1000	1 1	AO1 2.8.1b
2(a)(ii)	(**Y** was) found in deeper / older rock layer		1	AO3 2.8 2.8.1a/d
2(a)(iii)	The fossils of animals **Y** and **Z** have many features in common The fossil of animal **Y** is more complex than the fossil of animal **Z**		1 1	AO3 2.8 2.8.1a/d

4.6.3.4 Evidence for evolution

Answer 19 · Mark scheme

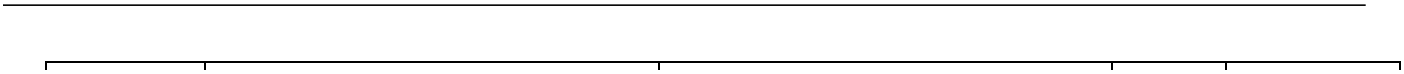
June 2017 | BL2FP | Original Q2 | Legacy

2(b)(i)	any **two** from: examples of physical factors, e.g. • flooding • volcanic activity (allow volcanoes) • asteroid collision • drought • ice age / temperature change / global warming • tsunami / earthquake / tornado examples of biological factors e.g. • predators / hunters / poachers • disease / named pathogen • competition for **or** lack of food / water • competition for mates **or** lack of mates • cyclical nature of speciation • lack of habitat **or** habitat change **or** deforestation	allow 2 physical factors or 2 biological factors or one of each for full marks ignore pollution ignore nuclear explosions ignore natural selection if no other answers given allow natural disaster / climate change / weather change / catastrophic event / environmental change for **1** mark	2	AO1 2.8 2.8.1e
2(b)(ii)	lack of evidence **or** no-one was there to observe it happening **or** cannot perform experiment to test		1	AO3 2.8 2.8.1e
Total			**8**	

4.6.3.4 Evidence for evolution

Answer 19 · Mark scheme

June 2017 | BL2FP | Original Q2 | Legacy



4.6.3.4 Evidence for evolution

Answer 20 · Mark scheme

June 2018 | 8461/2F | Original Q3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	(organism) soft-bodied **or** (fossil) destroyed	allow lack hard parts / skeleton / shell allow (organism) eaten / decayed allow buried (very) deep allow they are (very) small	1	AO1 4.6.3.5
03.2	any **two** from: • the fish (dies) buried in sediment / sand / mud • (only) the soft parts decayed / eaten **or** the hard parts / bones did not decay or were not eaten • mineralisation occurred	allow other examples of sediments do **not** accept rock(s) allow description of mineralisation eg bones turned to stone allow imprinted (in the sediment)	2	AO2 4.6.3.5
03.3	any **two** from: • drought • ice age / global warming • volcanic activity • asteroid / meteor collision • (new) predators • (new) disease / named pathogen • competition for food • competition for mates • lack of habitat or habitat change	ignore pollution allow earthquakes / tsunami allow hunters / poachers allow eaten allow lack of food allow isolation or lack of mates if no other marks awarded allow natural disaster / climate change / weather change / catastrophic event / environmental change for **1** mark	2	AO1 4.6.3.6

4.6.3.4 Evidence for evolution

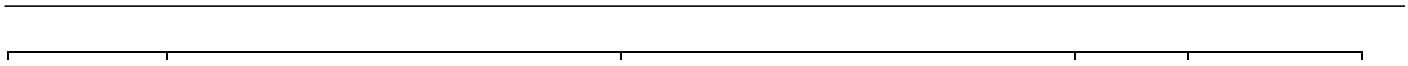
Answer 20 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	a change in a gene		1	AO1 4.6.2.1
03.5		allow in terms of an example		AO1 4.6
	there is variation (between members of a species)	allow mutation	1	4.6.2.2 4.6.3.1
	better adapted survive	allow 'survival of the fittest'	1	
	(reproduce and) pass on (favourable) allele(s) / gene(s) / mutation(s) / DNA / genetic material	ignore pass on characteristic(s)	1	
Total			**9**	

4.6.3.4 Evidence for evolution

Answer 20 · Mark scheme

June 2018 | 8461/2F | Original Q3



4.6.3.4 Evidence for evolution

Answer 21 · Mark scheme November 2020 | 8461/2F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	*Elasmotherium*		1	AO2 4.6.4
06.2	eukaryota		1	AO2 4.6.4
06.3	Carl Woese		1	AO1 4.6.4
06.4	any **one** from: • fighting / competing for mates / food / territory • to kill predators / prey	allow for defence / protection	1	AO2 4.7.1.1 4.7.1.4
6.5	(bones **or** hard tissues) did not decay	allow soft tissues decayed **or** were eaten allow other parts decayed or were eaten allow horn could be damaged / lost in fighting	1	AO1 4.6.3.5
06.6	any **one** from: • compare to other fossils of known age • by the age of the rocks (where fossil was found)	allow compare with the fossil record allow depth underground (where fossil was found) allow (radio)carbon / isotope dating allow DNA analysis	1	AO2 4.6.3.5 4.6.3.6

4.6.3.4 Evidence for evolution

Answer 21 · Mark scheme

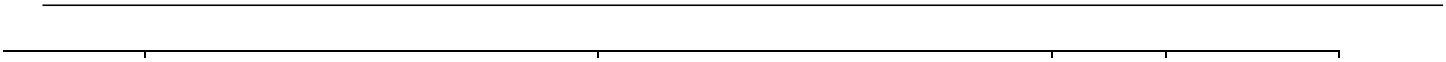
November 2020 | 8461/2F | Original Q6

06.7 mark with 06.8	0.05 (million years ago)		1	AO2 4.6.3.6
06.8 mark with 06.7	0.2 – 0.05 0.15 150 000 (years)	allow 0.05 × 3 allow ecf from question **06.7** allow 0.15 million (years)	1 1 1	AO2 4.6.3.6
06.9	any **two** from: • drought • ice age / global warming • volcanic activity • asteroid / meteor collision • (new) predators • (new) disease • competition for food • competition for mates • lack of habitat **or** habitat change	ignore pollution allow earthquakes / tsunami allow hunters / poachers / eaten allow named pathogen allow lack of food allow isolation **or** lack of mates if no other marks awarded allow natural disaster **or** climate change **or** catastrophic event for **1** mark	2	AO2 4.6.3.6
Total			**12**	

4.6.3.4 Evidence for evolution

Answer 21 · Mark scheme

November 2020 | 8461/2F | Original Q6



4.6.3.4 Evidence for evolution

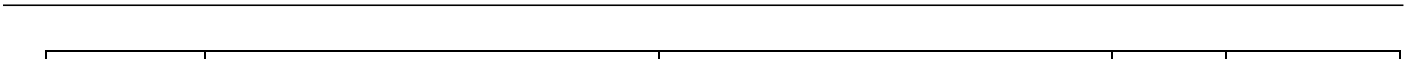
Answer 22 · Mark scheme November 2021 | 8461/2F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	Alfred Russel Wallace Charles Darwin		1 1	AO1 4.6.3.1 4.6.3.2
01.2	remains of an organism from a long time ago	allow remains of an animal / plant allow from thousands / millions of years ago	1 1	AO1 4.6.3.5
01.3	the animal walked on mud		1	AO2 4.6.3.5
01.4	any **two** from: • flooding • drought • ice age • global warming • volcanic activity • asteroid collision • (new) predators • (new) disease / pathogen • competition for food • competition for mates • lack of habitat **or** habitat change	 } if none of these, allow climate change for **1** mark ignore weather } if neither of these, allow catastrophic event **or** natural disaster for **1** mark allow hunters / poachers allow named example allow lack of food allow lack of mates ignore competition unqualified ignore environment change ignore isolation ignore pollution	2	AO1 4.6.3.6
01.5	bacteria can become resistant to an antibiotic older fossils are simpler than more recent ones		1 1	AO1 4.6.2.2 4.6.3.4
Total			**9**	

4.6.3.4 Evidence for evolution

Answer 22 · Mark scheme

November 2021 | 8461/2F | Original Q1



4.6.3.4 Evidence for evolution

Answer 23 · Mark scheme

June 2022 | 8461/2F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1 *view with Table 3*	kingdom genus	in this order only	1 1	AO1 4.6.3.5 4.6.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	Linnaeus		1	AO1 4.6.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	*Elrathia kingii*		1	AO2 4.6.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	trilobite **A** was found in older rocks than trilobite **B** trilobite **B** is more complex than trilobite **A**		1 1	AO3 4.6.3.4 4.6.3.5

4.6.3.4 Evidence for evolution

Answer 23 · Mark scheme

June 2022 | 8461/2F | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	sediments soft parts minerals	in this order only	1 1 1	AO2 4.6.3.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6	any **three** from: • drought • ice age • global warming • volcanic activity • asteroid collision • (new) predators • (new) disease / pathogen • competition for food • competition for mates • lack of habitat or habitat change	if none of these, allow climate change for **1** mark ignore weather if neither of these, allow catastrophic event **or** natural disaster for **1** mark allow named example allow hunters allow named example allow lack of food allow lack of mates ignore competition unqualified ignore isolation ignore pollution	3	AO1 4.6.3.6

4.6.3.4 Evidence for evolution

Answer 23 · Mark scheme

June 2022 | 8461/2F | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.7	no / insufficient evidence **or** cannot perform experiment to find out	allow lack of evidence allow no-one was there to observe	1	AO3 4.6.3.5 4.6.3.6

Total Question 7		**13**

4.6.3.4 Evidence for evolution

Answer 24 · Mark scheme

June 2023 | 8461/2F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.1	6000 (kJ/m^2/year)		1	AO2 4.7.5.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.2	$\frac{40}{16\,000} \times 100$ 0.25 (%)		1 1	AO2 4.7.5.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.3	cows move less indoors it is warmer indoors		1 1	AO1 4.7.5.2

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.4	cows are close(r) together	allow cows are in an enclosed space	1	AO2 4.7.5.2 4.3.1.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.5	any **one** from: • D • G • H		1	AO3 4.6.3.7 4.1.1.6 4.3.1.8

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.6	DNA		1	AO1 4.6.3.7

4.6.3.4 Evidence for evolution

Answer 24 · Mark scheme

June 2023 | 8461/2F | Original Q4

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.7	reproduction		1	AO2 4.6.3.7 4.3.1.1

Question	Answers	Extra information	Mark	AO / Spec Ref.
04.8	any **two** from: • many animals will become ill • resistant bacteria passed from animal to animal • animals cannot be cured (by the antibiotic) • animals may be less productive / efficient • farmer may lose profit / money	ignore reference to crops allow many animals may die allow disease passed from animal to animal **or** other animals infected allow antibiotic will not work allow less meat / milk produced allow less growth allow cannot sell infected produce / animals	2	AO2 4.3.1.1 4.6.3.7 4.7.5.2

Total Question 4	11

4.6.3.4 Evidence for evolution

Answer 25 · Mark scheme

June 2025 | 8461/2F | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	any **two** from: • (ichthyosaur died and) is buried in sediment / sand / mud / silt • (only) soft parts decayed / eaten **or** bones were not decayed / eaten • bone(s) / remains replaced by minerals	allow skeleton **or** hard parts for bones throughout ignore compression ignore reference to oxygen do **not** accept (icthyosaur died and) is buried in rock(s) allow mineralisation of bones allow bone(s) left imprint in mud / sand / sediment (that then hardened to rock) ignore bones turned to stone / rock	2	AO2 4.6.3.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.2	120 × 17 2040 (mm) 2.04 (metres)	allow conversion to metres at any stage allow correct conversion of incorrectly calculated length	1 1 1	AO2 4.6.3.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	phylum family	in this order only	1 1	AO1 4.6.3.5 4.6.4

4.6.3.4 Evidence for evolution

Answer 25 · Mark scheme

June 2025 | 8461/2F | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.4	any **two** from: • ice age • global warming • volcanic activity • asteroid collision • new predators • (new) disease / pathogen • competition for mates • lack of habitat **or** habitat change	 } if neither of these, allow climate change for **1** mark ignore weather } if neither of these, allow catastrophic event **or** natural disaster for **1** mark allow named example allow hunters allow named example allow lack of mates ignore competition unqualified ignore environment change allow competition between **ichthyosaurs** for food ignore isolation ignore pollution ignore lack of food	2	AO1 4.6.3.6

Total Question 8	9

4.6.3.4 Evidence for evolution

Answer 21 · Examiner comments November 2020 | 8461/2F | Original Q6

Question 6 (low & standard demand)

This question was about classification, the fossil record and extinction. In **06.5** students often did not make themselves clear when describing the decomposition of various tissues. 'It' or 'they' decomposed were insufficient as the subject of the question was bones. A number of students described the fossils themselves as decomposing. Students did not find **06.6** easy, often just rephrasing the question. A small number suggested the use of carbon dating but the most common correct answers referred to depth or age of the rocks in which the fossils were found as a means of dating them.

06.7 was not well done. Many students were unable to determine the correct time period from the scale on the graph. Some of those who got close to the answer did not realise that the answer line was already primed with 'million' and left their answer as '50 000 million' million. Very few students were able to work out the required answer to **06.8**, despite the mark scheme making allowance for errors from the previous question being carried forward. Many showed numbers in their working which had no evidence of their origin from the graph.

Answer 23 · Examiner comments June 2022 | 8461/2F | Original Q7

Question 7

This question was about classification, evolution and extinction.

07.1 **Table 3** gave the classification of two species of trilobite with two of the classification groups left blank. Students had to choose the missing groups, *kingdom* and *genus*, from a list of five alternatives. Only a quarter of students chose correctly. 'Community' and 'mammal' proved to be good distractors.

07.2 A similarly small proportion knew that the given classification system was invented by Linnaeus. In fact, 'Darwin' was a more common choice.

07.3 The binomial name of trilobite **A** should have been relatively easy to deduce from **Table 3** but *Elrathia kingii* was the *least* common option selected from the three given alternatives.

4.6.3.4 Evidence for evolution

Answer 23 · Examiner comments — June 2022 | 8461/2F | Original Q7

07.4 The correct two pieces of evidence in support of the scientist's hypothesis that trilobite **B** may have evolved from trilobite **A** were that **A** was found in older rocks and that **B** was the more complex of the two. Almost 40 percent of students ticked both these options, but the idea that both were found in the same type of rock, although incorrect, was commonly selected.

07.5 Completion of the three sentences to describe fossilisation, using words from the box, proved challenging for many with only one in eight getting all three correct.

07.6 Considering the number of times that causes of extinction have been asked for in previous examination years, performance here was not as strong as might have been expected. However those who gained marks often referred to climate change or global warming, predators and the lack of food. Common insufficient answers included 'changes' in temperature (which happen by the hour) and unsuitable 'weather' or 'environmental change', each of which is too vague. Fewer than one quarter were able to give three suitable suggestions.

07.7 A lack of evidence or that nobody was there at the time were each given frequently as a suggestion for why scientists cannot be sure of the cause of extinction of the trilobites. Weaker students got no further than saying that it was a 'long time ago' or that there are 'many ways to become extinct'. Only just over one third gained credit.

Answer 24 · Examiner comments — June 2023 | 8461/2F | Original Q4

Question 4

This question was about energy balances for cattle raised indoors and outdoors, and problems caused by the development of antibiotic resistance in bacteria that might cause disease in the cattle.

04.1 This was a simple sum that required selection of appropriate data from Table 3. Although many students used the data correctly, it was clear that many did not read the question or the table headings correctly, as a variety of answers such as '6002' (adding all the values) and '5900' (subtracting, rather than adding) were given instead of the required value: 6000.

4.6.3.4 Evidence for evolution

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04.2 Many students were able to substitute the correct values into the equation, thus gaining the first mark. However, when it came to giving a final answer, it was not uncommon for students to multiply the answer by 100 again, giving an answer of '25%', rather than 0.25%, thus showing a weak understanding of percentages. Fewer than half the students arrived at the correct answer.

04.3 Half the students were able to select both less movement indoors and it being warmer indoors as two reasons why it was more energy efficient to keep cattle indoors.

04.4 This question was generally well done with more than three-quarters of students stating that the cows were 'closer together' indoors and hence diseases would spread more rapidly. The idea of being 'in an enclosed space' was seen occasionally.

04.5 From Figure 7, it was evident to two-thirds of students that the antibiotic discs with no zone of inhibition (either D, G or H) were ones to which the bacterium was resistant.

04.6 The vast majority also understood that a change in a bacterium's DNA (rather than carbohydrate or lipid) was responsible for antibiotic resistance.

04.7 Most students also understood that a change in one bacterium could cause millions more to become resistant due to the bacteria having a high rate of reproduction.

04.8 The fact that antibiotic resistance in bacteria could become a problem to farmers was variously attributed to illness in the farmer's cattle, their productivity decreasing and them not being able to be cured of their illness by antibiotic treatment and hence the farmer's profits being decreased. Some students struggled to be able to express themselves sufficiently clearly in their answers and only one-quarter scored both of the available marks.

4.6.3.4 Evidence for evolution

Answer 25 · Examiner comments

June 2025 | 8461/2F | Original Q8

Question 8 (Standard demand)

08.1

This question required students to apply their knowledge of fossil formation to the specific example of an ichthyosaur fossil.

Only two steps in the fossilisation process were required to score full marks, so misunderstanding or omission of one step, was not critical. Only 7% of students achieved the full 2 marks, with 60% scoring no marks or not attempting the question.

Students that gained credit often did so for showing an understanding of the first step in fossil formation, by referring to sediment, or an appropriate synonym. However, several also referred to the dead animal being buried in 'rock' or in 'rocks' which disqualified this idea. Whether this burying occurred before or after decay was not important in the award of the mark.

Although some students were aware that the dead ichthyosaur had decayed, they were often imprecise in terms of what had decayed. Some described the whole 'body' or the 'tissues' decaying, which implied that both soft and hard material decays. Very few students referred to the soft tissues being eaten (by detritivores).

4.6.3.4 Evidence for evolution

Answer 25 · Examiner comments

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08.2

Students were provided with the length of the fossil image and the relevant magnification factor and were required to calculate the real length of the fossil.

Many students completed this calculation well with 40% gaining all 3 available marks. The most common error was in converting millimetres to metres, where a conversion factor of 100 was not uncommon. Some students completed the conversion in two steps, first converting to centimetres, then to millimetres, perhaps showing a lack of confidence.

A not uncommon error was for students to use the magnification equation, with the two values as numerator and denominator. It was rare then, for students to attempt to convert their answer to metres.

08.3

Students were required to recall the classification hierarchy, completing a partial classification using given terms.

This was very well attempted with over half of students gaining at least 1 mark. It was clear that many students had remembered the sequence by using a mnemonic. However, many students confused population for phylum, presumably due to the same initial letter.

08.4

Students were required to suggest causes for the extinction of ichthyosaurs, and over 50% of students gained at least one of the available 2 marks.

Although this should not be an unfamiliar question to students who have practised from previous examination papers, the context of the information provided meant that some general answers were insufficient. The information in the question was that ichthyosaurs lived in the sea, consequently 'drought' was not credited. Similarly, the information provided stated that ichthyosaurs were in competition with other predators for food, thus a 'lack of food' was ignored, as was the presence of 'predators'. For this last idea, a mark could only be awarded if any predators were described as being 'new'.

Common correct responses included reference to 'disease' and 'habitat loss', although all of the possible answers were seen.